

WHAT IS CLAIMED IS:

1. A ferroelectric thin film element comprising a substrate and an epitaxial ferroelectric thin film provided on said substrate:
 - 5 wherein said epitaxial ferroelectric thin film satisfies a relation $z/z_0 > 1.003$ wherein a crystal face parallel to a crystal face of a surface of the substrate among crystal faces of said epitaxial ferroelectric thin film is taken as a Z crystal face,
 - 10 a face spacing of said Z crystal face is taken as z and a space of the Z crystal face of a material constituting said epitaxial ferroelectric thin film in a bulk state is taken as z_0 , and also satisfies a relation $0.997 \leq x/x_0 \leq 1.003$ wherein one of crystal faces of said epitaxial ferroelectric thin film
 - 15 perpendicular to the Z crystal face is taken as an X crystal face, a face spacing of the X crystal face is taken as x and a face spacing of the X crystal face of the material constituting said epitaxial
 - 20 ferroelectric thin film in a bulk state is taken as x_0 .
2. A ferroelectric thin film element according to claim 1, wherein said epitaxial ferroelectric thin film has a thickness within a range of 2 to 100 nm.
- 25 3. A ferroelectric thin film element according

to claim 1, further comprising at least a buffer layer between said substrate and said epitaxial ferroelectric thin film.

5 4. A ferroelectric thin film element according to claim 3, wherein at least one of said substrate and said buffer layer is electroconductive.

10 5. A ferroelectric thin film element according to claim 1, wherein said epitaxial ferroelectric thin film has a crystal orientation degree of the Z crystal face, measured by a $2\theta/\theta$ method with an X-ray incident angle θ to the Z crystal face, is 90 % or higher.

15 6. A ferroelectric thin film element according to claim 1, wherein said Z crystal face has a crystal orientation degree of 99 % or higher.

20 7. A ferroelectric thin film element according to claim 1, wherein said epitaxial ferroelectric thin film has a perovskite structure.

25 8. A ferroelectric thin film element according to claim 1, wherein said epitaxial ferroelectric thin film includes a lead (Pb) atom or an oxygen (O) atom as a constituent atom.

9. A ferroelectric thin film element according to claim 1, wherein said epitaxial ferroelectric thin film has a tetragonal crystal structure and the Z crystal face is a (001) face.

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10. A ferroelectric thin film element according to claim 1, wherein said epitaxial ferroelectric thin film has a rhombohedral crystal structure and the Z crystal face is a (111) face.

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11. A ferroelectric thin film element according to claim 1, wherein said epitaxial ferroelectric thin film has a hexagonal crystal structure and the Z crystal face is a (0001) face.

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12. A ferroelectric thin film element according to claim 1, wherein said epitaxial ferroelectric thin film has a rhombic crystal structure and the Z crystal face is a (011) face.

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13. A piezoelectric actuator comprising a substrate and an epitaxial ferroelectric film provided on said substrate:

wherein said epitaxial ferroelectric film
25 satisfies a relation $z/z_0 > 1.003$ wherein a crystal face parallel to a crystal face of a surface of the substrate among crystal faces of said epitaxial

ferroelectric film is taken as a Z crystal face, a
face spacing of said Z crystal face is taken as z and
a space of the Z crystal face of a material
constituting said epitaxial ferroelectric film in a
5 bulk state is taken as z_0 , and also satisfies a
relation $0.997 \leq x/x_0 \leq 1.003$ wherein one of crystal
faces of said epitaxial ferroelectric film
perpendicular to the Z crystal face is taken as an X
crystal face, a face spacing of the X crystal face is
10 taken as x and a face spacing of the X crystal face
of the material constituting said epitaxial
ferroelectric film in a bulk state is taken as x_0 .

14. A piezoelectric actuator according to claim
15 13, wherein said epitaxial ferroelectric thin film
has a thickness within a range of 100 nm to 10 μm .

15. A piezoelectric actuator according to claim
13, further comprising at least a buffer layer
20 between said substrate and said epitaxial
ferroelectric film.

16. A piezoelectric actuator according to claim
15, wherein at least one of said substrate and said
25 buffer layer is electroconductive.

17. A piezoelectric actuator according to claim

13, wherein said epitaxial ferroelectric film has a crystal orientation degree of the Z crystal face, measured by a $2\theta/\theta$ method with an X-ray incident angle θ to the Z crystal face, is 90 % or higher.

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18. A piezoelectric actuator according to claim 13, wherein said Z crystal face has a crystal orientation degree of 99 % or higher.

10 19. A piezoelectric actuator according to claim 13, wherein said epitaxial ferroelectric film has a perovskite structure.

15 20. A piezoelectric actuator according to claim 13, wherein said epitaxial ferroelectric film includes a lead (Pb) atom or an oxygen (O) atom as a constituent atom.

20 21. A piezoelectric actuator according to claim 13, wherein said epitaxial ferroelectric film has a tetragonal crystal structure and the Z crystal face is a (001) face.

25 22. A piezoelectric actuator according to claim 13, wherein said epitaxial ferroelectric film has a rhombohedral crystal structure and the Z crystal face is a (111) face.

23. A piezoelectric actuator according to claim 13, wherein said epitaxial ferroelectric film has a hexagonal crystal structure and the Z crystal face is a (0001) face.

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24. A piezoelectric actuator according to claim 13, wherein said epitaxial ferroelectric film has a rhombic crystal structure and the Z crystal face is a (011) face.

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25. A liquid discharge head for discharging a liquid utilizing a piezoelectric actuator according to claim 13.